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THE USE AND EVALUATION OF COMPUTER ASSISTED INSTRUCTION FOR TEACHING INTRODUCTORY PRINCIPLES OF PRODUCTION ECONOMICS

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Introduction

The introductory course in Agricultural Economics at The Ohio State University introduces the student to basic economic principles. It is a required course for most of the students in the College of Agriculture and School of Natural Resources, being taken during the student's freshman or sophomore year. The course is taught in sections of approximately 75 students, meeting five days per week with the same instructor. The approximate annual enrollment is 1000 students.

An important segment of the course deals with production principles and the related cost concepts. These concepts are difficult for many of our students to master at a satisfactory level. Many of the students need a supplement to the text and classroom discussions to adequately grasp the material in the alloted time.

After consideration of several alternatives, Computer Assisted Instruction (CAI) was selected as the vehicle to assist these students because: 1) It provided problem situations that reinforced the learning process, 2) It provided the opportunity for the student to schedule his learning experience, 3) It permitted the student to proceed through the learning material at his own pace, 4) It provided comparable treatment of subject matter topics in a multisection course, and 5) It provided a review for students enrolled in advanced courses in the department.

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The CAI Program

The instructional material covered factor-product, factor-factor, and product-product and the short run cost concepts. The economic concepts were applied to farm enterprise situations by requiring the student to make economic decisions commonly faced by most farmers. As the student answered these questions during the role playing, the computer analyzed his responses. If he was correct, the program proceeded to the next step; if he was wrong, he was tutored or helped to find the correct response.

A teletypewriter terminal was the interface between the student and the computer. The degree of typing skill required, however, was kept to a minimum as only short answers were required. Paper printout of the learning experience allowed the student the opportunity for further study and review.

Student Reaction

During Spring Quarter, 1971, this program was first used for one section of the course. The class consisted of 59 students, 53 males and 6 females.

A study was conducted on student attitudes toward this program using this initial class. The primary objective of this study was to analyze student reactions and attitude changes brought about by exposure to the CAI materials developed for the course.

In order that student reactions to the use of CAI could be analyzed, an attitude test (Table 1) was administered to the sample prior to and immediately following CAI exposure. Responses to the attitude statements after CAI exposure generally exhibited attitudes that were interpreted to be more favorable toward auto-tutorial instruction (Table

Table 1. Attitude Statements and Mean Responses Before and After CAI with T-values for Difference in Means

1. I prefer the standard (conventional) form of education to auto-tutorial instruction.

2. Auto-tutorial instruction helps the student conceptualize concepts better than lectures.

3. Being able to ask questions in class is important.

4. I like the freedom auto-tutorial instruction provides.

5. Most students would use auto-tutorial facilities much more if they were located in convenient places.

6. I like being able to go to an auto-tutorial facility at my convenience rather than being required to go to a scheduled class.

7. The use of auto-tutorial instruction is of little help to me since I cannot ask questions as I go.

8. Auto-tutorial instruction is better than teacher contact in learning routine concepts.

9. I can learn more by studying my notes and reading the text than by going to a listening booth or some other auto-tutorial facility.

10. I would like to be able to go to an auto-tutorial facility to learn basic information for my courses.

11. Auto-tutorial instruction does not provide adequate individual attention.

12. I would like to be able to go to an auto-tutorial facility to review basic information for my courses.

13. Auto-tutorial instruction is probably a waste of my time.

14. Computers provide many useful services for our society.

15. Computers are too complex to be useful to me.

16. I would like to take a course in computer programming.

17. The computer diminishes the importance of the individual in our society.

18. Computers perform many routine tasks in our technological age.

2). Twelve of the eighteen statements showed a significant change in attitude at the 95% level or above

Admittedly, some of the change in responses may have been brought about by factors other than CAI exposure. The students recognized that CAI use was new and experimental in Agriculture Economics, and it was fairly obvious that the questionnaires were related to the CAI material. These factors could have caused the "Hawthorne effect"[1] to affect the results of the attitude questionniares. However, the level of significance of the attitude changes indicate that CAI exposure was a primary factor in producing these changes.

Usefulness of CAI

After CAI use, the students were asked to evaluate the usefulness of CAI in teaching Agriculture Economics 100. A continuum scale from 0 to 10 was used to measure their evaluation; 0 indicating CAI was not useful and 10 indicating it was very useful. The results in Table 3 show that 55 of the 59 students thought CAI had been a beneficial learning experience (a rating of 5 or higher on the response continuum scale in Table 3).

Of the four students who rated CAI low in usefulness, three were students who had high examination scores. Perhaps CAI should have been offered as a substitute for regular class attendance for the high achievers.

The 59 students in the sample also were asked what they liked and disliked about CAI. Several items were consistently mentioned by the

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[1] The "Hawthorne effect" is named for a famous group of studies which showed that the results of an experiment may be affected by the subject's knowledge that he is part of an experimental group.

Table 2. Mean Responses to Attitude Statements Before and After CAI with T-values for Differences in Means.

Attitude Statement	mean before CAI	mean after CAI	T-value
1	2.186	2.831	3.564**
2	2.610	3.305	4.064**
3	1.542	1.407	1.262
4	3.508	3.898	2.280*
5	2.203	1.898	2.280*
6	3.729	3.627	.551
7	2.780	3.576	4.851**
8	2.610	2.525	.478
9	2.831	3.610	4.898**
10	3.593	3.808	2.736**
11	2.339	3.169	5.287**
12	3.950	4.220	2.109*
13	3.610	4.237	4.679**
14	4.237	4.458	1.714
15	3.644	4.136	4.473**
16	3.085	3.169	.500
17	3.102	3.492	2.178*
18	4.136	4.271	1.227

** - significant at 99% probability level
* - significant at 95% probability level

Table 3. The Usefulness of CAI in Teaching Agricultural Economics 100; Student Responses and Analysis of Variance.

Response Frequency Distribution

Response	Number of Times Given
0 (Not useful)	1
1	1
2	2
3	0
4	0
5	3
6	8
7	10
8	17
9	14
10 (Very useful)	3

students as favorable features. These items are listed below (the number of times each was mentioned is indicated in parentheses).

1. The CAI printout gave the students a good set of notes from which to study. (20).

2. CAI allowed the students maximum flexibility in the scheduling of their time. (11)

3. CAI provided tutorial assistance when they experienced difficulty in learning subject matter. (11)

4. CAI presented the material in a clear, organized, concise manner. (10)

5. The CAI course in Agricultural Economics provided examples and realistic applications of the material. (9)

6. CAI helped the students understand the textbook and classroom discussions. (8)

7. CAI was a good review of the text and classroom discussions. (8)

8. CAI provided individual attention by asking each student questions about the material.[2] (8)

9. CAI forced the students to think and participate.[3] (6)

10. CAI material was easier to understand than the textbook. (6)

11. CAI allowed students to go at their own speed. (5)

12. It was a learning experience to use the computer. (3)

13. CAI should be used in other courses. (3)

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[2]One student explained, "CAI asked me questions that I had to answer in order to continue, but in class questions are asked and answered sometimes when I don't fully understand them. CAI actually gives more individual attention, which I prefer to attention in class."

[3]One student indicated, "It forced me to pay attention to concepts being taught by making me respond to questions as I went. In class, note taking is often just a writing process and not a thinking process. This (CAI) forced me to think about the material."

The negative concern registered by students dealt with scheduling of terminals and an occasional computer system failure.

This program has been in use for over a year with a very high acceptance by the students. Slight modifications have been made and additional materials are being developed.

Based upon our experience with CAI, its application is not limited to college courses. Its application should be equally useful to all levels of education, including continuing education.